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PROBABLE REPLACEMENT CLUTCHES BY BOOTED EAGLES (*HIERAAETUS PENNATUS*)
IN THE TIETAR RIVER VALLEY OF CENTRAL SPAIN

The Booted Eagle (*Hieraaetus pennatus*) is a summer resident species in Spain whose breeding ecology is poorly known (Brown and Amadon 1968, *Eagles, hawks, and falcons of the world*, Vols. 1 and 2, McGraw-Hill Book Company, New York, NY U.S.A.; Cramp and Simmons 1980, *Handbook of the birds of Europe, the Middle East, and North Africa*, Vol. 2, Oxford Univ. Press, Oxford, U.K.; Brown et al. 1982, *The birds of Africa*, Vol. 1, Academic Press, London, U.K.). Available information is limited to scarce data on clutch sizes, laying dates, productivity, and food habits (Labitte 1955, *Alauda* 23:249–253; Suetens and Van Groenendael 1969, *Ardeola* 15:19–36; Iribarren 1975, *Ardeola* 21:305–330; Steyn and Grobler 1981, *Ostrich* 52:108–118). To my knowledge, replacement clutches have not been reported for this species. Here, I report the first records of replacement clutches in Booted Eagles.

The data were obtained during a long-term study of breeding ecology of the species in the Tietar River valley (Ávila Province, central Spain, 40°40'N, 4°42'W) from 1995–2000. This is a mountainous area (300–2594 m) with large tracts of pine forest (*Pinus pinaster*) interspersed with smaller clearings of cultivated lands and scrubland. Booted Eagles arrive from their wintering grounds in late March and early April. Known territories were checked every two days to estimate arrival dates of each pair. The rest of the study area was surveyed intensively each year during March–April to locate new pairs. Nests were checked first after the female was observed in incubation posture. Eggs were measured and marked with felt pens, and I noted if they were warm or cold. When single eggs were found in nests during the first nest visits, I made a second visit two days later, or as soon as weather conditions permitted.

Only two replacement clutches were found among 82 breeding attempts with accurately-known clutch sizes. The first replacement clutch was recorded in May 1998. This pair nested on a platform used by a pair of Black Kites (*Milvus migrans*) during the previous year. Aggressive interactions between the pair of Black Kites and the Booted Eagles were frequently observed before the first nest check on 25 April. On this first visit, I found a recently-broken Booted Eagle egg on the ground below the nest and another egg on the nest. On 29 April the female was not incubating, but was seen perched near the nest tree. I revisited the nest again on 2 May and a new Booted Eagle egg was found and marked. On that visit, I did not find remains of the original eggs. Three days later the nest was checked again, and only the marked egg was found. On 13 June, I visited the nest again, but the egg was not found.

The second replacement clutch was observed in May 1998 at a newly-occupied nesting territory. I had surveyed this area since 1995 but did not find any evidence that Booted Eagles occupied the site. On 13 April 1998, I found the nest of this pair and, on 17 April, I found the female incubating one egg in the nest. The nest was checked again two days later, and I found only the marked egg. The female was incubating when the nest was visited again 38 d later (the typical incubation period). The marked egg was in the nest, dirty and only slightly warm. Three days later, I visited the nest again. There were eggshell remains of the original egg, and a new recently-laid egg, cold, clean, and completely white was found. A Booted Eagle was flying over the nest site. On 5 July, the nest was checked again, but only eggshell remains were found.

The adult Booted Eagles were not marked, so I was not absolutely sure that these were replacement clutches. They could have been new clutches of different pairs of eagles. If these were cases of pair replacement, I would have observed more than two birds in the same territory, aggressive interactions between individuals, courtship displays, and/or territorial flights as I observed in other cases of suspected pair changes. Therefore, I concluded that these were replacement clutches laid by Booted Eagles whose initial clutches failed early in the nesting season. After failing in the early stages of the breeding cycle, Booted Eagles may produce one replacement egg, supporting the suggestion that mid-size raptors that usually lay only one clutch can lay replacement eggs if they have lost the original clutch at an early stage (Newton 1979, *Population ecology of raptors*, T. & A.D. Poyser, London, U.K.).

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